

THE CHEMICAL HYGIENE PLAN

UPDATED FEBRUARY 2013 BY CHARLES MARTUCCI, PhD

A. POLICY

It is the policy of the Polytechnic Institute of NYU [as represented by the Polytechnic Corporation and the Office of the President] to provide a safe and healthy workplace in compliance with the Occupational Safety and Health Act of 1970 and regulations of the Department of Labor including 29 CFR 1910.1450 "Occupational Exposure to Hazardous Chemicals in Laboratories." The full laboratory standard is included as Appendix A of this Chemical Hygiene Plan.

On 31 January, 1990 the Occupational Safety and Health Administration (OSHA) promulgated a final rule for occupational exposure to hazardous chemicals in laboratories. Included in the standard, which became effective on 1 May, 1990 is a requirement for all employers covered by the standard to develop and carry out the provisions of a Chemical Hygiene Plan (CHP). The standard requires that the CHP must be developed and implemented by January 31, 1991.

A CHP is defined as a written program which describes procedures, engineering controls, personal protective equipment and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace. Components of the CHP must include standard operating procedures for safety and health, criteria for the implementation of control measures, measures to ensure proper operation of engineering controls, provisions for training and information dissemination, permitting requirements, provisions for medical consultation, designation of responsible personnel, and identification of particularly hazardous substances.

B. PURPOSE

This document constitutes the Chemical Hygiene Plan required by the above regulation. The purpose of the CHP is to describe proper practices and procedures to be followed by employees, students, visitors and other personnel working in each laboratory of the university. This CHP is maintained readily available to laboratory employees at Polytechnic Institute of NYU.

* It is the responsibility of the faculty, administration, and the research, supervisory and laboratory personnel to know and follow the procedures outlined in this plan.

* All operations performed in the laboratory must be planned and executed in accordance with the enclosed procedures.

* In addition, each employee is expected to develop safe personal chemical hygiene habits aimed at the reduction of chemical exposures to themselves and coworkers.

C. PERSONNEL COVERED BY THIS PLAN

This Chemical Hygiene Plan applies to all work involving hazardous substances that is conducted in laboratory spaces [as defined in the Room List of Polytechnic Institute of NYU] carried out by faculty and other laboratory employees, students and visitors working in Polytechnic laboratories.

D. SCOPE

The OSHA Laboratory Standard is a PERFORMANCE STANDARD. There are relatively few specific requirements to carry out particular procedures in a particular way. Specific RESULTS to be achieved are spelled out, but the manner by which these results are to be achieved generally are not delineated.

This document was developed to comply with paragraph (e) of the referenced OSHA 1910.1450 standard. Polytechnic Institute of NYU will maintain the facilities and procedures employed in the laboratory compatible with current knowledge and regulations in laboratory safety. This CHP will be reviewed, evaluated and updated at least annually and is readily available to employees, their representatives and any representative of the Assistant Secretary of Labor for OSHA.

ACKNOWLEDGEMENT

Portions of this Chemical Hygiene Plan were drawn from the manuals: OSHA Laboratory Standard 29 CFR Implementation Guide" by Leo C. Hearn, Jr., Steven L. Goode, and David F. Coble, Lewis Publishers, 1991; "Prudent Practices for Handling Hazardous Chemicals in Laboratories," prepared by the National Academy of Sciences' Committee on Hazardous substances in the Laboratory [National Academy Press, Washington, D.C. 1981, "Prudent Practices in the Laboratory: Handling and Disposal of Chemicals," National Academy Press, Washington, D.C. 1995 and "Developing a Chemical Hygiene Plan" by Jay A. Young, Warren Kingsley and George H. Wahl, Jr., American Chemical Society, Washington D.C. 1990.

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1.0 SCOPE, RESPONSIBILITY, AUTHORITY AND RESOURCES

1.1 Scope

1.1.1 The OSHA Laboratory Standard applies to laboratories that meet the following four criteria:

* Chemical manipulations are carried out on a laboratory scale. That is, the work with chemicals is on a scale that can easily and safely be handled by one person.

* Multiple chemical procedures are used.

* Protective laboratory practices and equipment are available and commonly used [e.g. including, but not limited to fume hoods, eye protection, skin protection and respiratory protection.]

* The laboratory procedures involved are not part of a production process whose function is to produce commercial quantities of materials, nor do the processes in any way simulate a production process.

1.1.2 Production processes and pilot plant operations are covered by other relevant OSHA standards. However, if "the operations do not proceed to production, but remain part of the research activity", operations are covered by the standard.

1.1.3 Most laboratories in higher educational institutions that use chemicals are subject to the requirements of the laboratory Standard.

1.2 Employer Responsibilities under the OSHA Laboratory Standard

Institutions that fall under the OSHA Laboratory Standard have certain obligations. These include:

1.2.1 Keep records of employee exposures to hazardous chemicals:

1.2.1.1 Records should include any measurements made to monitor exposures, as well as any medical consultations, examinations, & written opinions.

1.2.1.2 Maintain these records as mandated in 29 CFR 1910.20, Access to Employee Exposure and Medical Records.

1.2.2 Provide your employees with:

1.2.2.1 Training and Information regarding chemical and physical hazards.

1.2.2.2 Identification of other hazards [subparts D through T of 29 CFR]

1.2.2.3 Access to medical consultation and examinations.

1.2.2.4 Respirators, when deemed necessary by the Laboratory Supervisor and Chemical Hygiene Officer per current OSHA standards.

1.3 Employer Responsibilities and the Chemical Hygiene Plan

1.3.1 The Chief Executive Officer [President of the University] has the ultimate responsibility for safety, including chemical hygiene, and with the assistance of other program administrators, will provide continued support for chemical hygiene. The chemical hygiene officer acts as the representative of the chief executive officer in this capacity.

1.3.2. The Dean of Engineering & Applied Science and Vice President for Operations has responsibility and authority to see that the CHP is written, implemented and updated. This officer appoints the University Safety Officer, the Chemical Hygiene Officer and appoints members of the University Safety Committee.

1.3.3 The Department Heads have responsibility for implementation of the CHP and have responsibility for the safety and health of employees, visitors, students and other personnel conducting work within their departments.

1.3.4 Laboratory Supervisors

The Laboratory Supervisor is the faculty member or other principal investigator in charge of each laboratory that uses any chemicals within any department in the University. The duties and responsibilities of the laboratory supervisor are defined in the OSHA Laboratory Standard and the Polytechnic Institute of NYU Chemical Hygiene Plan.

1.3.5 Laboratory Workers

The laboratory workers are employees of the university, including but not limited to faculty members, visiting scientists, postdoctoral fellows, graduate students, undergraduate students and technical support staff. Laboratory workers are individually responsible for:

1.3.5.1 Planning and conducting each laboratory operation in accordance with the Chemical Hygiene Plan,

1.3.5.2 Developing good personal chemical hygiene and safety habits.

1.3.6. The Chemical Hygiene Officer should be qualified by training and experience [not defined in the standard] to provide technical guidance in the development and implementation of the Chemical Hygiene Plan. The chemical Hygiene Officer shall:

1.3.6.1 Work with administrators and employees to develop and implement appropriate chemical hygiene policies and practices.

1.3.6.2 Monitor procurement and use of chemicals and ensure that training levels are adequate for chemicals in use.

1.3.6.3 Perform regular chemical hygiene and housekeeping inspections as described in [but not limited to] sections 2.3.9 2.7.4. and 3.2.2.8

1.3.6.4. Review and improve the CHP annually for all campuses of the University.

1.3.7 The Polytechnic Institute of NYU Safety Committee carries out the functions of the Chemical Hygiene Committee.

1.3.3.1 The Chemical Hygiene Committee assists the Dean of Engineering and Vice President for Operations with the development and implementation of the CHP. The Chemical Hygiene Committee provides advice and assistance to laboratory supervisors with regard to implementation of the CHP and training of university personnel.

1.3.3.2 Members of the Chemical Hygiene Committee 2013

Chair, Safety Officer Prof Charles Martucci

Director of Facilities Management, Annie Carino [or her designee]†

Departmental Representatives:

* Department of Chemical and Biomolecular Engineering [Abhijit Mitra]

*Undergraduate Freshman Chemistry Laboratories [Volodymyr Krynytskyy]

2.0 Standard Operating Procedures for Management of Laboratory Chemicals

2.1 Chemical Procurement

2.1.1 The decision to procure a chemical shall be a commitment to handle and use the chemical properly from initial receipt to ultimate disposal.

2.1.2 Requests for procurement of new chemicals shall be submitted to the Chemical Hygiene Officer [or designee] for approval. The form entitled "Polytechnic Purchase Requisition" will serve as New Chemical Purchasing Request form. Information on proper handling, storage and disposal shall be known to all involved personnel prior to the procurement of the chemical. Chemicals utilized in the laboratory shall be those which are appropriate for the ventilation system.

2.1.3 All chemicals shall be ordered through the Polytechnic Purchasing.

2.1.3.1. Personnel who receive chemical shipments shall be knowledgeable of the proper procedures for receipt. Purchaser or user of the chemical [or designee] has responsibility for receipt and disbursement of material safety data sheets.

2.1.3.2 Chemical containers shall not be accepted without accompanying labels and packaging in accordance with all appropriate regulations.

2.1.3.3. All chemical shipments should be inspected and dated when received.

2.2 Chemical Storage - Store Room and Research/Teaching Laboratories

2.2.1 Large glass containers shall be placed in carrying containers or shipping containers during transportation.

2.2.2 The storage area shall be well-illuminated, with all storage maintained below eye level. Large bottles shall be stored no more than two feet from ground level.

2.2.3 Chemicals shall be segregated by hazard classification and compatibility [including, but not limited to flammables, corrosives, toxic, strong oxidizers] in a well-identified area, with local exhaust ventilation.

2.2.3.1 Mineral acids should be separated from flammable and combustible materials. Separation is defined by NFPA 49 as storage within the same fire area but separated by as much space as practicable or by intervening storage separate from incompatible materials. NFPA approved safety cabinets will be used for storage of flammables and corrosives consistent with NYC Fire Codes.

2.2.3.2 Acid-resistant trays shall be placed under bottles of mineral acids.

2.2.3.3 Acid-sensitive materials such as cyanides and sulfides shall be separated from acids or protected from contact with acids.

2.2.3.4 Highly toxic chemicals [including designated carcinogens] or other chemicals whose containers have been opened shall be stored in unbreakable secondary containers. Examples include, but are not limited to organomercurials, and carcinogens or suspect carcinogens such as benzene, carbon tetrachloride and other materials so designated on the MSDS supplied or by NIOSH [see 1990 NIOSH Pocket Guide to Chemical Hazards.]

2.2.4 The storage area shall not be used as a preparation or repackaging area.

2.2.5 The storage area shall be accessible during normal working hours. The storage area is under the control of Chemical Storeroom Supervisor, Volodymyr Krynytskyy (Laboratory Technician)

2.2.6 When chemicals are taken from the storage area, they shall be placed in an outside container or bucket for transport to the laboratory or worksite.

2.2.7 Storage of chemicals at the lab bench or other work areas shall be limited to those amounts necessary for one operation or shift. The container size shall be the minimum convenient, practical and safe. The amounts of chemicals at the lab bench shall be as small as practical.

2.2.8 Storage of chemicals in laboratories shall be the minimum practical and shall be in compliance with New York City Fire code. Storage cabinets for Flammables and for corrosives shall be used in compliance with NFPA code. Chemicals that have been designated as carcinogens or carcinogen suspect by agencies including but not limited to NIOSH shall be stored in secondary containers and/or in a designated, vented storage cabinet.

2.2.9 Chemicals in the workplace shall not be exposed to sunlight or heat. Care should be exercised to keep chemicals away from windows and from radiators.

2.2.10 Stored chemicals in the Chemical Storeroom shall be examined at least annually by the Chemical Hygiene Officer [or designee] for replacement, deterioration, and container integrity. The inspection should determine whether any corrosion, deterioration, or damage has occurred to the storage facility as a result of leaking chemicals. The supervisor [faculty member or Principal Investigator] for each laboratory [or the supervisor's designee] shall examine chemicals stored in their laboratories annually for replacement, deterioration and container integrity.

2.2.11 Periodic inventories of chemicals outside the Central Chemical Storage area shall be conducted by the Chemical Hygiene Officer [or designee]. Unneeded items shall be properly discarded or returned to the storage area.

2.3 Chemical Handling

Each laboratory employee with the training, education and resources provided by supervision, shall develop and implement work habits consistent with this CHP to minimize personal and coworker exposure to the chemicals in the laboratory. Based on the realization that all chemicals inherently are hazardous under certain conditions, exposure to all chemicals shall be minimized. Materials Safety Data Sheets [MSDS] for chemicals used in each laboratory space must be readily available to employees.

General precautions which shall be followed for the handling and use of all chemicals are:

2.3.1 Skin contact with all chemicals shall be avoided.

2.3.2 All employees shall wash all areas of exposed skin prior to leaving the laboratory.

2.3.3 Mouth suction for pipetting or starting a siphon is prohibited.

2.3.4 Eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present shall be avoided. These areas have been posted. Hands shall be thoroughly washed prior to performing these activities.

2.3.5 Storage, handling and consumption of food or beverages shall not occur in storage areas, refrigerators, glassware or utensils also used for laboratory operations.

2.3.6 Risk determinations shall be conservative in nature.

2.3.6.1 Any chemical mixture shall be assumed to be as toxic as its most toxic component.

2.3.6.2 Substances of unknown toxicity shall be assumed to be toxic.

2.3.7 Laboratory employees shall be familiar with the symptoms of exposure for the chemicals with which they work and the precautions necessary to prevent exposure. It is the responsibility of the laboratory supervisor to make this information available to employees through Materials Safety Data Sheets [MSDS] and other relevant sources.

2.3.8 In all cases of chemical exposure, neither the Permissible Exposure Limits (PELs) of OSHA or the Threshold Limit Values (TLVs) of the American Conference of Governmental Industrial Hygienists (ACGIH) shall be exceeded.

2.3.9 The engineering controls and safety equipment in laboratories shall be utilized and inspected in accordance with Appendix A of this plan.

2.3.10 Specific precautions based on the toxicological characteristics of individual chemicals shall be implemented as deemed necessary by the Chemical Hygiene Officer (see 7.2). These special precautions are listed in Section 8.0.

2.3.11 The intent and procedures of this Chemical Hygiene Plan shall be continuously adhered to.

2.4 Laboratory Equipment and Glassware

Each employee shall keep the work area clean and uncluttered. All chemicals and equipment shall be properly labeled in accordance with Section 2.7. At the completion of each work day or operation, the work area shall be thoroughly cleaned and all equipment properly cleaned and stored.

In addition, the following procedures shall apply to the use of laboratory equipment:

2.4.1 All laboratory equipment shall be used only for its intended purpose.

2.4.2 All glassware will be handled and stored with care to minimize breakage; all broken glassware will be immediately disposed of in the broken glass container.

2.4.3 All evacuated glass apparatus [vacuum system] shall be shielded to contain chemicals and glass fragments should implosion occur.

2.4.4 Labels shall be attached to all chemical containers, identifying the contents and related hazards.

2.4.5 Waste receptacles shall be identified as such.

2.4.6 All laboratory equipment shall be inspected on a periodic basis as specified in Appendix A, and replaced or repaired as necessary.

2.5 Personal Protective Equipment

2.5.1 Safety glasses meeting the ANSI Z87.1 standard are required for employees and visitors to the laboratory and will be worn at all times when in the laboratory. Contact lenses are prohibited in the laboratory, except as approved by the Chemical Hygiene Officer and supervisor.

2.5.2 Chemical goggles and/or a full face shield shall be worn during chemical transfer and handling operations as procedures dictate.

2.5.3 Sandals, perforated shoes, sneakers and bare feet are prohibited. Safety shoes, per ANSI 47 are required where employees routinely lift heavy objects.

2.5.4 Lab coats or plastic/rubber aprons should be worn in the laboratory when caustic, toxic or hazardous chemicals are used.

2.5.5 Appropriate chemical-resistant gloves based on the Table in Appendix B shall be worn at all times when there may be skin contact with chemicals. Used gloves shall be inspected and washed prior to re-use. Damaged or deteriorated gloves will be immediately replaced. Gloves shall be washed prior to removal from the hands.

2.5.6 Thermal-resistant gloves shall be worn for operations involving the handling of heated materials and exothermic reaction vessels. Thermal-resistant gloves shall be non-asbestos and shall be replaced when damaged or deteriorated.

2.5.7 Respirator usage shall comply with the OSHA Respiratory Protection Standard, 29 CFR 1910.134, and Polytechnic University's Respiratory Training Program.

2.6 Personal Work Practices

2.6.1 The Laboratory supervisor must ensure that each employee knows and follows the rules and procedures established in this plan.

2.6.2 All employees shall remain vigilant to unsafe practices and conditions in the laboratory and shall immediately report such practices and/or conditions to the laboratory supervisor. The laboratory supervisor must correct unsafe practices and or conditions promptly.

2.6.3 Long hair and loose-fitting clothing shall be confined close to the body to avoid being caught in moving machine/equipment parts.

2.6.4 Use only those chemicals appropriate for the ventilation system as determined by the laboratory supervisor.

2.6.5 Avoid unnecessary exposure to all chemicals by any route [inhalation, ingestion or skin contact.]

2.6.6 Do not smell or taste any chemicals.

2.6.7 Encourage safe work practices in coworkers by setting the proper example. Horseplay is strictly forbidden.

2.6.8 Seek information and advice from knowledgeable persons, standards and codes about the hazards present in the laboratory. Plan operations, equipment and protective measures accordingly.

2.6.9 Use engineering controls in accordance with Section 4.0.

2.6.10 Inspect personal protective equipment [gloves, safety glasses or goggles, respirators, etc] prior to use, and wear appropriate protective equipment as procedures dictate and when necessary to avoid exposure.

2.7 Labeling

2.7.1 All containers in the laboratory shall be labeled. This includes chemical containers and containers of used or waste chemicals. The label shall be informative and durable, and at a minimum, will identify contents, source, date of acquisition, storage location and indication of hazard.

2.7.2 Portable containers shall be labeled by the individual using the container.

An example is a small bottle of a chemical to be kept for a reasonable period of time in a laboratory refrigerator or on a laboratory bench.

2.7.3 Exemptions for labeling requirements shall be made for chemical transfers from a labeled container into a container which is intended only for the immediate use of the employee who performed the transfer. Examples are the transfer of material into a graduated cylinder to measure volume or the use of a beaker or container to measure weight of a substance.

2.7.4 The labeling process and practices shall be periodically inspected by the Chemical Hygiene Officer [or designee] to ensure that labels have not been defaced or removed.

3.0 Criteria for Implementation of Control Measures

3.1 Air Sampling

3.1.1 Air sampling for evaluating employee exposure to chemical substances shall be conducted periodically or as specified by specific codes or regulations.

3.1.2 Upon addition of new chemicals or changes in control procedures, additional air sampling will be considered to determine the exposures. Conduct air sampling if there is reason to believe that exposure levels for regulated substances that require sampling routinely exceed the action level, or in the absence of an action level, the PEL. Air sampling will be implemented when usage of highly toxic substances exceeds three times per week. It is the responsibility of the laboratory supervisor to see that such sampling is done in a timely manner.

3.1.3 The results of air sampling studies performed in the laboratory are maintained and recorded.

3.2 Housekeeping

3.2.1 Each laboratory worker is directly responsible for the cleanliness of his or her work space, and jointly responsible for common areas of the laboratory. The Laboratory Supervisor [or designee] is responsible for the maintenance of housekeeping standards.

3.2.2 The following procedures apply to the housekeeping standards of the laboratory:

3.2.2.1 All spills on lab benches or floors shall be immediately cleaned and properly disposed of. Large spills will necessitate the implementation of the Emergency Action Plan per OSHA 1910.38 and 1910.120.

3.2.2.2 The lab benches shall be kept clear of equipment and chemicals except those necessary for the work currently being performed.

3.2.2.3 The work area shall be cleaned at the end of each operation and each shift.

3.2.2.4 All apparatus shall be thoroughly cleaned and returned to storage upon completion of usage.

3.2.2.5 All floors, aisles, exits, fire extinguishing equipment, eyewash stations, showers, electrical disconnects and other emergency equipment shall remain unobstructed.

3.2.2.6 Labeled containers should be placed so that the label faces front.

3.2.2.7 Chemical containers shall be clean, properly labeled and returned to storage upon completion of usage.

3.2.2.8 All chemical wastes will be disposed of in accordance with the Polytechnic Institute of NYU waste disposal plan under the supervision of the Chemical Store Room Supervisor.

3.3 Safety and Emergency Equipment

3.3.1 Telephone numbers of emergency personnel, supervisors and other workers as deemed appropriate are to be posted in laboratories and other designated areas.

3.3.2 Prior to the procurement of new chemicals, the Chemical Hygiene Officer [or designee] shall verify that existing extinguishers and other emergency equipment are appropriate for such chemicals.

3.3.3 All employees who might be exposed to chemical splashes shall be instructed in the location and proper usage of emergency showers and eyewash stations. The eyewash and emergency shower shall be inspected periodically by the laboratory supervisor [or designee]. These inspections shall be in accordance with ANSI Z358.1 and manufacturer's specifications. Records shall be maintained.

3.3.4 Location signs for safety and emergency equipment shall be posted in laboratories and other designated areas at all times.

4.0 Engineering Controls

4.1 Intent

The engineering controls installed in the laboratory are intended to minimize employee exposure to chemical and physical hazards in the workplace. These controls must be maintained in proper working order for this goal to be realized.

4.2 Modification

No modification of engineering controls will occur unless testing indicates that worker protection will be inadequate.

4.3 Improper Function

Improper function of engineering controls must be reported to the Office of Facilities and the Chemical Hygiene Officer immediately. The system shall be taken out of service until proper repairs have been executed.

4.4 Usage

All employees shall follow proper work practices when using the engineering controls.

4.4.1 Local Exhaust Ventilation - Laboratory Hoods

The following procedures shall apply to the use of local exhaust ventilation: The laboratory hoods shall be utilized for all chemical procedures which might result in release of hazardous chemical gases, vapors or fumes. As a general rule, the hood shall be used for all chemical procedures involving substances which are appreciably volatile and have a permissible exposure limit (PEL) less than 50 ppm PEL values.

4.4.1.1 The ventilation system shall be inspected by the Chemical Store Room supervisor [or designee] every three months. The face velocity shall be maintained at not less than 80 to 100 feet per minute. A record of each inspection shall be maintained by the Chemical Hygiene Officer.

4.4.1.2 Prior to a change in chemicals or procedures, the adequacy of the ventilation system shall be determined by the Chemical Hygiene Officer Or Chemical Store Room Supervisor.

4.4.1.3 The following work practices shall apply to the use of hoods:

4.4.1.3.1 Confirm adequate hood ventilation performance prior to opening chemical containers inside the hood. An inward flow of air can be confirmed by holding a thin strip of paper at the face of the hood and observing the movement of the paper.

4.4.1.3.2 Keep the sash of the hood closed at all times except when adjustments within the hood are being made. At these times, maintain the sash height as low as possible.

4.4.1.3.3 Storage of chemicals and equipment inside the hood shall be kept to a minimum.

4.4.1.3.4 Minimize interference with the inward flow of air into the hood.

4.4.1.3.5 Leave the hood operating when it is not in use if hazardous chemicals are contained inside the hood or if it is uncertain whether adequate general laboratory ventilation will be maintained when the hood is non-operational.

4.4.1.3.6 The hood shall not be used as a means of disposal for volatile chemicals.

4.4.2 Glove Boxes and Instrument Exhaust Ducts ["elephant trunks"]

The exhaust air from a glove box or "elephant trunk" will pass through scrubbers or other treatment before release into the regular exhaust system. Exception to this procedure must be granted by the Chemical Hygiene Officer in consultation with the Laboratory Supervisor.

4.4.3 Venting of Storage Cabinets

Storage cabinets for flammable and hazardous chemicals will be ventilated as needed.

4.4.3.1 Generally, NFPA approved flammable liquid safety storage cabinets will NOT be vented.

4.4.3.2 Storage cabinets that contain very toxic or very smelly chemicals will be vented. An AMCA-C type spark-resistant fan and explosion-proof motor must be used for venting.

5.0 Employee Information and Training

5.1 Hazard Information

All employees will be apprized of the hazards presented by the chemicals in use in the laboratory. Each employee shall receive training at the time of initial assignment to the laboratory, prior to assignments involving new exposure situations, and at a regular frequency as determined by the Chemical Hygiene Officer.

5.2 Education and Training

The education and training of employees [and students] shall be appropriate to their level of use of and exposure to chemicals and shall include measures employees can take to protect themselves from the hazards of chemicals through good work practices, engineering controls and use of personal protective equipment. The training shall present information about the Chemical Hygiene Plan, and shall include;

5.2.1 the contents of the OSHA laboratory standard and its appendices;

5.2.2 the location and availability of the Chemical Hygiene Plan;

5.3.3 the permissible exposure limits for OSHA regulated substances or recommended exposure values for other hazardous chemicals not regulated by OSHA which are present in the laboratory;

5.3.4 signs and symptoms associated with exposure to the chemicals present in the laboratory;

5.3.5 location and availability of reference material on chemical hygiene;

5.3.6 training shall be conducted by The Chemical Hygiene Officer [or Designee]. Written materials are supplemented with audiovisual materials and demonstrations during classes and training;

6.0 Prior Approval of Laboratory Activities

6.1 Permit System

A permit system shall be used for laboratory activities which present specific, foreseeable hazards to the employees. These activities include off-hours work, sole occupancy of building, hazardous operations and unattended operations. Such a permit entitled "Chemical Hygiene Permit" shall be executed prior to the performance of these activities.

6.1.1 Off-Hours Work Procedures

Laboratory personnel are not permitted to work after hours in the lab, except when granted written permission by their laboratory supervisor. A copy must be kept on file with the Office of Facilities management.

6.1.2 Sole Occupancy

Laboratory personnel should not work alone in the laboratory unless a system of crosschecks is established by the laboratory supervisor.

6.1.3 Hazardous Work

All hazardous operations are to be performed during a time when at least two personnel are present at the laboratory. At no time shall a laboratory person, while working alone in the laboratory, perform work which is considered hazardous. The determination of hazardous operations shall be made by the laboratory supervisor in writing with a copy kept on file in the departmental office of the supervisor.

6.1.4 Unattended Operations

Every effort should be made to avoid unattended laboratory operations [for example overnight or weekend] When laboratory operations are performed which will be unattended by laboratory personnel, the following procedures will be employed:

6.1.4.1 The laboratory supervisor will review work procedures to ensure the safe completion of the operation and issue letter of permission for the employee, with a copy kept on file in the office of Facilities Management.

6.1.4.2 An appropriate sign will be posted at all entrances to the laboratory.

6.1.4.3 The overhead lights in the laboratory will be left on and emergency phone numbers left with the Office of Facilities Management.

6.1.4.4 The person responsible for the operation will return to the laboratory at the conclusion of the operation to assist in the dismantling of the apparatus.

7.0 Medical Consultations and Examinations

7.1 An opportunity to receive medical attention is available to all employees who work with hazardous chemicals in the laboratory. The opportunity for medical attention will be made available to employees under the following circumstances:

7.1.1 Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory,

7.1.2 Medical surveillance programs will be established where exposure monitoring reveals an exposure level above the action level for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, and/or,

7.1.3 Whenever an event takes place in the laboratory such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure the employee will be provided an opportunity for medical consultation for the purpose of determining the need for medical examination.

7.2 These medical consultations and examinations shall be provided without cost to the employees, without loss of pay and at a reasonable time and place.

7.3 These medical consultations and examinations shall be administered by or under the direct supervision of a licensed physician through the Polytechnic Health Plan.

8.0 Special Precautions

When laboratory procedures change to require the use of additional classifications of chemicals (allergens, embryotoxins, reproductive toxins, carcinogens, flammables.), additional special precautions shall be implemented as deemed necessary by the Chemical Hygiene Officer. Written permission from the Department Head and Chemical Hygiene Officer shall be required for all laboratory use of embryotoxins, neurotoxins, reproductive toxins and carcinogens. All questions regarding the use of such materials should be addressed to the Chemical Hygiene Officer..

8.1 Working with Allergens, Neurotoxins, Embryotoxins and Reproductive Toxins

8.1.1 Suitable gloves to prevent hand contact shall be worn when exposed to allergens or substances of unknown allergen activity.

8.1.2 Neurotoxins, embryotoxins and chemicals of known or suspected reproductive hazard will be handled only in a hood with confirmed satisfactory airflow performance and will require the use of protective equipment to prevent skin contact as prescribed by the laboratory supervisor and Chemical Hygiene Officer.

8.1.3 Neurotoxins, embryotoxins and known reproductive toxins will be stored in adequately ventilated areas in unbreakable secondary containers. Waste containers of such materials must be used with secondary containment and be appropriately labeled.

8.1.4 The Laboratory Supervisor, University Safety Officer and Chemical Hygiene Officers will be notified of spills and other exposure incidents involving allergens, neurotoxins, embryotoxins and reproductive toxins. A physician will be consulted when appropriate.

8.2 Working with High Toxicity (Special Precautions).

Check MSDS for any special precautions.

8.2.1 Areas where these chemicals are stored and used must have restricted access and have special warning signs. All containers should be labeled clearly with chemical composition, known hazards and precautions for handling.

8.2.2 Only persons directly involved in the laboratory work and who have been advised of special precautions that may apply should have access to laboratories where highly toxic chemicals are handled. Written permission from the Laboratory Supervisor, Department Head and Chemical Hygiene Officer is required. A copy of such documents shall be kept in the Departmental files.

Two people will always be present during work with these chemicals

8.2.3. Procedures involving highly toxic substances that can generate dust, vapors or aerosols must be conducted in a hood, glove box or other suitable containment device and will be trapped by scrubber or HEPA filter, as determined by the Laboratory Supervisor in consultation with the Chemical Hygiene Officer.

8.2.4 Properly selected gloves and long sleeves will be used. Hands and arms will be washed immediately after working with these chemicals.

8.2.5 Laboratory workers must use appropriate face and eye protection to prevent ingestion, inhalation and skin absorption of toxic chemicals in case of unexpected events. Such personal protective equipment should be selected in consultation with the Laboratory Supervisor.

8.2.6 Equipment used for the handling of highly toxic substances should be suitable isolated from the general laboratory environment. Laboratory vacuum pumps used with these substances should be protected by HEPA filters or scrubbers and vented into an exhaust hood.

8.2.7 Any contaminated equipment or glassware will be decontaminated in the hood before removing them from the designated area.

8.2.8 Transport of very toxic chemicals from one location to another should be planned carefully. Samples should be carried in unbreakable secondary storage containers. Personal protective equipment appropriate for the material should be worn.

8.2.9 Spill control and appropriate emergency response kits should be kept nearby and laboratory workers should be trained in their use.

8.2.10 Working with Animals and Chemicals of High Toxicity

8.3 Working with Flammable Chemicals

8.3.1 Chemicals with a flash point below 93.30C [200°F] will be considered "fire-hazard chemicals."

8.3.2. Such substances must be handled in areas free of ignition sources. Never heat fire-hazard chemicals with an open flame. Use an appropriate exhaust system such as a fume hood when transferring or handling flammables.

8.3.3 Keep containers of flammables tightly closed at all times when not in use.

8.3.4 Store flammables in Flammable storage cabinets [in accordance with NFPA codes] or in an explosion-proof refrigerator. Use the smallest quantity of flammable

substances consistent with need. Consult NFPA manual 30 and manual 45 for additional information.

8.4 Working with Corrosive Chemicals

Major classes of corrosives include mineral acids [including, but not limited to hydrochloric, hydrofluoric, nitric and sulfuric acids], strong bases [including but not limited to metal hydroxides and ammonia, strong oxidizers [including but not limited to hydrogen peroxide] and strong dehydrating agents [including but not limited to phosphorous pentoxide and calcium oxide]

8.4.1. Personal protective equipment including both safety goggles and face shield, gloves known to be resistant, and a laboratory apron or laboratory coat shall be used when handling corrosives.† For large scale studies, special facilities with restricted access will be provided.

8.4.2 Neutralizing agents such as sodium bicarbonate should be kept in the laboratory for use in case of spills.†

8.4.3 Store corrosive wastes by class separated from other chemicals and dispose of as hazardous chemical waste.

8.4.4 Plastic or rubber gloves and fully buttoned lab coats will be worn when working with highly toxic or corrosive chemicals.

8.5 Working with Reactive Chemicals

A reactive chemical is one that is defined as such by the MSDS, and/or is identified as an oxidizer, a peroxide or explosive or is known or found to be reactive with other substances.

8.5.1. Highly reactive substances should be stored separately from other materials.

8.5.2 Personal protective equipment should be used by laboratory workers, including goggles and face shields and appropriate gloves.

8.5.3 Avoid exposure of highly reactive materials to light, heat shock and catalysts, consistent with MSDS information.

9.0 Recordkeeping

9.1 Accident investigations will be conducted by the immediate Laboratory Supervisor with assistance from safety personnel as deemed necessary.

9.2 Accident reports will be written and retained for 30 years.

9.3 Exposure records for hazardous chemicals and harmful physical agents will be maintained for 30 years per 29 CFR 1910.20.

9.4 Medical records for employees exposed to hazardous chemicals and harmful physical agents will be maintained for the duration of employment plus 30 years per 29 CFR 1910.20.

9.5 Records of inspections of equipment will be maintained for 15 years.

9.6 Records of employee training will be maintained for 15 years

10.0 Chemical Spills, Releases and Accidents

In the event of a chemical spill, release or other accident, Polytechnic Institute of NYU will adhere to the procedures outlined in the Emergency Response plan as required by OSHA standard 29 CFR 1910.38 and 1910.120.

11.0 Annual Chemical Hygiene Plan Audit

The Chemical Hygiene Officer will conduct an audit of all phases of the Chemical Hygiene Plan each year. Results will be provided to the ranking official and the Laboratory Supervisor. Supervisors are responsible for taking corrective action. Appendix A will be used as a guide for the audit.

12.0 References and Recommended Reading

Code of Federal Regulations, 29 CFR part 1910 subpart Z section 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories, 1990.

Guidelines for Incorporating Safety and Health into Engineering Curricula, Vol 1, Joint Council for Health, Safety and Environmental Education of Professionals

Malachowski, M.J. Health Effects of Toxic Substances, Government Institutes, Inc, Rockville, MD 1995

Mercier, Paul, Laboratory Safety Pocket Guide, Genium Publishing, Schenectady, NY, 1996

National Research Council, Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Academy Press, Washington, D.C. 1981.

National Research Council, Prudent Practices for Disposal of Chemicals from Laboratories, National Academy Press, Washington, D.C., 1983.

National Research Council, Prudent Practices in the Laboratory: Handling and Disposal of Chemicals, National Academy Press, Washington, D.C. 1995

NIOSH Pocket Guide to Chemical Hazards, Superintendent of documents, U.S. Government Printing Office, Washington, DC, 1990

OSHA Regulated Hazardous Substances: Health, Toxicity, Economic and Technological Data

Noyes Data Corp, Park ridge, N.J. 1990

Safety in Academic Chemistry Laboratories, American Chemical Society Publication, Washington, D.C. 1990

Stricoff, R.S. and Walters, D.B. Handbook of Laboratory Health and Safety, 2nd Edition, John Wiley & Sons, Inc, New York, NY, 1995

Young, J.A., Kingsley, W.K. and Wahl, G.H. Jr, Developing a Chemical Hygiene Plan, The American Chemical Society Publication, Washington, D.C, 1990.

APPENDIX A

LABORATORY SAFETY INSPECTION GUIDELINES

All laboratories shall be periodically inspected to ensure that Polytechnic:

- * Maintains laboratory facilities and equipment in a safe operating condition
- * Provides a safe working environment for all employees and the public
- * Ensures that all laboratory procedures are conducted in a safe and prudent manner.

Inspection shall include [but not be limited to] verify

- * That water is kept in drain traps to minimize odors and vapors
- * Proper clamping of hose connections.
- * Wiring is not defective or improper [including frayed cords, improper connections, improper use of extension cords, and routing of power and control wiring in the same path.]
- * Proper fittings for flammable or toxic gases.
- * Storage of flammables relative to potential ignition sources.
- * Guarding and Shielding of rotating machinery, heating devices, high pressure and vacuum equipment.
- * Aisles and exits free of obstacles and clutter
- * Presence and condition of emergency devices including fire extinguishers, safety showers, eyewash stations, fire blankets, spill control kits and first aid kits.
- * Compliance with OSHA "Lock-out/Tag-out Regulations CFR 1910.147
- * Proper storage of, flammables, corrosives, hazardous and toxic substances.
- * Proper storage and use of compressed gas cylinders
- * Materials Safety Data Sheets for chemicals in use in the laboratory are accessible to persons working in the laboratory.

APPENDIX B

RESISTANCE TO CHEMICALS OF COMMON GLOVE MATERIALS

Laboratory personnel should wear gloves whenever handling

- * hazardous chemicals,

- * sharp-edged objects,

- * toxic chemicals including [but not limited to] designated or suspect carcinogens such as Araclor 1254; benzene, carbon tetrachloride, chloroform, 50% chromic acid, 1,2 dichloroethane, ethylene dichloride, ethylene oxide, hydrazine, perchloroethylene, PCBs, 1,1,2,2 tetrachloroethane, 1,1,2,2 tetrachloroethylene, toluene diisocyanate, trichloroethylene, triethanolamine.

And reproductive toxins such as carbon disulfide.

- * very hot or very cold materials,

- * or substances of unknown toxicity.

*Wear gloves of a material known to be resistant to penetration by the substance in use. Wearing the wrong glove may increase hazard. Thicker gloves generally offer better protection than very thin gloves. However, users must check information provided by the supplier or manufacturer of gloves to determine suitability and consult with their laboratory supervisors.

* Inspect gloves for small holes or tears before using. If gloves are re-used, wash them carefully before removing them. Remove gloves before handling objects such as doorknobs, telephones, computer keyboards, and the like.

* Replace gloves periodically, depending on how often they are used and their permeation and degradation characteristics.